PHYS393 Statistical and Low Temperature Physics

Exam 2010

Common mistakes you can avoid
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1. Units are often left out in answers.

If an answer is supposed to have units, it is wrong to leave them out.

For example, 0.5 g is quite different from 0.5 kg.

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2. Workings and explanations are often left out.

This is unfavourable for the student.

First, you are quite likely to make a mistake in the calculations. However, if each step is explained correctly, you may still get most of the marks.

Second, without explanations, it may not be possible for the reader to understand the string of numbers in your working. Say what you have substituted or what you want to find every one or two lines.

Third, marks may be awarded for workings. Write out the numbers you substitute in a formula before giving the answer. Before that, remember to say what these numbers are or where they come from.

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3. How to get the mass of a sodium atom from its relative atomic mass, $A_r = 23$.

Method 1:

This does not mean that the mass of an atom of sodium is 23 g or 23 kg.

It means that 1 mole of sodium atoms is 23 g.

1 mole means N_A particles, where N_A is the Avogadro constant, 6.022×10^{23}.

Therefore, the mass of one atom is $23 \text{ g} \div 6.022 \times 10^{23}$

Note this is in grams.

If you want to substitute this into another formula, you may need to convert to kg.

Method 2:

Multiply A_r by the atomic mass unit, $m_u = 1.66 \times 10^{-27}$ kg

Therefore, the mass of one atom is $23 \times 1.66 \times 10^{-27}$ kg

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4. Some of you are still not sure of logarithms.

Note that $\log(x + y)$ is not equal to $\log x + \log y$

It is $\log(xy)$ that is equal to $\log x + \log y$

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5. For undergraduate physics, most formulae are in SI units.

For example, the Fermi energy formula $E_F = \frac{\hbar^2}{2m}\left(\frac{3\pi^2 N}{V}\right)^{2/3}$ is in SI units.

Suppose you are given that one mole of liquid helium-3 is 36.84 cm^3.

You may compute N/V using $N_A \div 36.84\ cm^3$

and get the answer for N/V in particles per cm^3.

If you want to use this in the above formula to find E_F,

you must convert it to particles per m^3 first.

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6. Number of significant figures.

Quite a number of students give only one significant figure in the answer.

This is not enough.

A reasonable number of significant figures is 3.

For intermediate answers, you need more, maybe 4 or 5 figures.

Otherwise the error will build up in later steps.

The number of significant figures in a number is obtained by counting the number of digits from left to right, starting from the first non-zero digit.

For example, the number of significant figures for 0.0002 is 1, not 5.

For example, the number of significant figures for 0.0001662 is 4, not 8.

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7. Quite a few scripts have handwritings that are difficult to read.

This means it is difficult to mark, and therefore difficult to give marks to.

It is difficult to know yourself if your handwriting is difficult for others to read, because you can obviously read it yourself.

Get a few people to read your handwriting and to give you some honest comments.

If you find that it is difficult for others to read your writing, try to print out each letter clearly in your script.

It is worth the effort.

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8. The way to write the exponential function.

You may write $e^{-\varepsilon/kT}$ or $\exp(-\varepsilon/kT)$.

Do not write $e(-\varepsilon/kT)$.